

REMARKS

Upon entry of the instant amendment, claims 1, 2, 4-6 and 8-27 will remain pending in the above-identified application, with claims 1, 2, 5, 6, 8, 10-25 standing ready for further action on the merits, and remaining claims 4, 5 and 9 being withdrawn from consideration based on an earlier restriction requirement of the Examiner.

In this Amendment, claims 1, 6 and 8 have been amended. Support for amendments to claims 1 and 6 can be found, for example, at page 7, lines 22-23, lines 29-31, and page 9, lines 14-16 of the present specification. Claim 8 has been amended in accordance with currently amended claim 6.

New claims 24-27 have been added. Support of claims 24 and 26 can be found at page 11, lines 28-32 of the instant specification. Support of claims 25 and 27 can be found at page 13, lines 12-18 of the instant specification.

Accordingly, the present amendments to the claims do not introduce new matter into the application as originally filed. As such entry of the instant amendment and favorable action on the merits is earnestly solicited at present.

Claim Rejections under 35 U.S.C. § 103 (a)

Claims 6 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schuhmacher et al. US '373 (US 4,310,373) in view of Wilkinson US '137 (US 2002/0161137).

Claims 1-2 and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schuhmacher et al. US '373 in view of JP 60-224847 (JP '847) and in view of Wilkinson US '137.

Claims 11-23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schuhmacher et al. US '373 in view of the JP '847 reference and Wilkinson US '137, and further in view of Laycock et al. US '014 (US 6,776,014).

Applicants respectfully traverse and request that the Examiner withdraw the rejections based on the following considerations.

Nonobviousness over the Combination of the Cited References

The present invention is directed to a highly fusible polyurethane elastic filament which has a specific retention of tenacity and a specific melting point. (See currently amended claim 6.) The present invention is also directed to a woven or knit fabric containing the highly fusible polyurethane elastic filament in combination with other fibers. (See currently amended claim 1.)

The claimed highly fusible polyurethane elastic filament is obtained by melt-spinning, without prior solidification, a polymer synthesized from (A) a both end isocyanate-terminated prepolymer prepared by the reaction of a specific polymer diol and a diisocyanate with (B) a both end hydroxy-terminated prepolymer prepared by the reaction of a specific polymer diol, a diisocyanate and a specific low molecular weight diol, wherein at least 50 wt% of the starting polymer diol is a polyether polyol, and has at least 50% retention of tenacity after dry heat treatment at 150°C for 45 seconds at 100% extension and a melting point of 180°C or below. (See claims 1 and 6.) Since the polyurethane filament of the present invention has such specific properties, especially the specific tenacity after dry heat treatment at 150°C for 45 seconds as recited in the claims, the polyurethane filament can fuse without breaking upon heat treatment at a fusing temperature of the polyurethane filament.

When a blended woven or knit fabric which contains the claimed highly fusible polyurethane elastic filament and non-elastic yarns is heat-set, heat fusion occurs at places where the polyurethane elastic filaments come into contact with the non-elastic yarns and at places where the polyurethane elastic filaments come into contact with each other, and thus a fabric having resistance properties against yarn slippage, grinning (corrugation), fraying, running, edge curling and slip-in are obtained without impairing tenacity.

The primary reference Schuhmacher et al. US '373 discloses a polyurethane prepared by a single-step-reaction which contains heating a mixture of reaction components including diisocyanate, polyol and combination of low molecular weight diols, obtaining a product of a polyurethane granule, melting the granule, and spinning.

Polyurethane in Schuhmacher et al. US '373 is not a filament as recited in the present invention but a heat-seal adhesive. The polyurethane is extruded in the form of a spun-bonded fabric onto a carrier fabric, which is then bonded to the surface of a textile by pressing and heating. Since the planner textiles are bonded through the polyurethane adhesive, the entire polyurethane should be melt in view of the nature of the invention as disclosed in Schuhmacher et al. US '373.

On the other hand, it is significant for the claimed polyurethane filament to maintain the properties of the polyurethane filament except for the crossover points in a woven or knit fabric where the polyurethane filament fuses upon heat treatment. Even though polyurethane of Schuhmacher et al. US '373 has the strength or low melting point obtained by the use of the combination of the diols, the entire polyurethane of Schuhmacher et al. US '373 melts so as to play a role of the adhesive, resulting in the loss of the strength as a filament. In other words,

according to Schuhmacher et al. US '373, the filament is cut or broken and eventually cannot work as filaments. Schuhmacher et al. US '373 is silence about strength as filament as required in the present invention. Rather, the invention of Schuhmacher et al. US '373 is intended to keep the strength of the bonded fabric by the use of the carrier fabric not by the polyurethane filament itself.

Thus, Schuhmacher et al. US '373 is not related to the polyurethane filament which has enough strength after fusing. On the other hand, the polyurethane filament of the present invention maintains the strength as the filament after fusing. More specially, as recited in the claims, the strength is significant in the present invention and defined as "at least 50% retention of tenacity after dry heat treatment at 150°C for 45 seconds at 100% extension." This definition means that the polyurethane filament of the present invention does not break when heat-treated up to the fusing temperature of polyurethane filament, unlike the polyurethane in Schuhmacher et al. US '373. In addition, the polyurethane adhesive in Schuhmacher et al. US '373 is made by the single-step-reaction which is completely different from the method by which the claimed filaments are obtained. So, the polyurethane filament of the present invention is quite different from Schuhmacher et al. US '373. Therefore, the claimed blended woven or knit fabric and the claimed polyurethane elastic filaments are quite different from products as disclosed in Schuhmacher et al. US '373, and thus Schuhmacher et al. US '373 fails to disclose or suggest the claimed invention.

Next, the secondary reference Wilkinson US '137 also fails to disclose or suggest the method of the present invention. It is alleged at pages 2-3 of the Office Action that Wilkinson

US '137 teaches that obtaining thermoplastic polyurethane elastic filaments by reacting a both ended isocyanate-terminated prepolymer prepared by the reaction of a polyol and a diisocyanate with a both end hydroxyl-terminated prepolymer prepared by the reaction of a polyol, a diisocyanate and a low molecular weight diol ([0022]-[0024] and claim 10), wherein at least 50 wt% of the starting polyol is a polyether polyol ([0035]) produces polyurethane fibers having good tenacity and recovery (abstract).

However, in paragraphs [0022]-[0024] and claim 10, Wilkinson US '137 teaches that obtaining polyurethane polymer fiber precursor by reacting a first soft polymer prepared by the reaction of a polyol (Mw: 1000-8000) and a first organic diisocyanate with a second hard polymer prepared by the reaction of a low molecular weight glycol (Mw: 62-112) and a second organic diisocyanate to obtain a final polyurethane polymer, and extruding the final polyurethane polymer to obtain a solid product of polyurethane polymer fiber precursor. The solid product is palletized and melted. It is then spun to obtain a polyurethane polymer fiber.

Thus, Wilkinson US '137 fails to teach or suggest the inventive method in which (A) a prepolymer obtained by reacting a specific polymer diol with a diisocyanate and having isocyanate groups (NCO groups) at both ends is reacted with (B) a prepolymer obtained by reacting a specific polymer dial with a diisocyanate and a specific low-molecular-weight diol and having hydroxyl groups (OH groups) at both ends are melt-spun without prior solidification. If the polyurethane polymer is pelletized once as disclosed in Wilkinson US '137, heat resistance of polyurethane filament is degraded due to thermal history. According to the present invention, such a disadvantage in the prior art can be effectively avoided by directly spinning the polymer without prior solidification, cooling and winding up, so that thermal history is minimized and the

polyurethane filament having at least 50% retention of tenacity following dry heat treatment under 100% extension at 150°C for 45 seconds, a melting point of 180°C or below, and at least 60% retention of tenacity following treatment in a 2 g/L aqueous sodium hydroxide solution under 100% extension at 100°C for 60 minutes is obtained. Wilkinson US '137 fails to disclose or suggest the claimed product and a method thereof.

Further, the Office Action states at paragraph 7 of page 6 thereof *"Wilkinson discloses at paragraph 0035 that all or part of the polyester polyol can be substituted with polyether polyol. Substituting all of the polyester polyol with polyether polyol would result in more than 50% of the polyol being polyether polyol."* However, Wilkinson US '137 merely discloses in paragraph [0035], *"As an alternative to the polyesters there may be used for reaction with the diisocyanate one or more elastomer yielding polyethers."* It is respectfully submitted that there is no disclosure in Wilkinson US '137 that at least 50 wt% of the starting polymer diol is a polyether polyol. Therefore, Wilkinson US '137 fails to disclose or suggest a polyurethane elastomeric filament having the specific tenacity and melting point as defined in the present invention, which can maintain the property of the filament after heat treatment at a fusing temperature of the polyurethane filament.

At any event, the combination of Schuhmacher et al. US '373 and Wilkinson US '137 fails to teach or suggest the claimed polyurethane filament obtained by the specific method and having the specific tenacity and the specific melting point. Further, the other secondary references (i.e., the JP '847 reference and Laycock et al. US '014) also fail to disclose or suggest the claimed features. Since the combination of Schuhmacher et al. US '373 and Wilkinson US '137 fails to teach the polyurethane filament of the present invention, further combination of the

JP '847 reference, which relates to a warp knit fabric containing elastic yarns, and the other the cited references also fails to teach or suggest the woven or knit fabric of the present invention.

As explained above, since the combination of the cited references fails to disclose or suggest the claimed features, there is no rationale and/or reasonable success based on the combination of the cited references for one skilled in the art to arrive at the present invention. Likewise, the present invention (independent claims 1, 6 and dependent claims thereof) is not obvious over the combination of the cited references.

Incidentally, Schuhmacher et al. US '373 teaches in column 2 lines 60-64 that the polyurethane may be prepared by heating a solvent-free mixture of the polyurethane reaction components and the ratio of isocyanate groups/hydroxyl groups (NCO/OH) in the reaction mixture times 100 is in the range of from about 96 to 100. On the other hand, the polyurethane filament of the present invention is obtained by the method wherein all the diisocyanate to the combined number of moles of all the polymer diol and all the low-molecular-weight diol (NCO/OH) is 1.02 to 1.20 (see claims 8, 24 and 26). Therefore, the polyurethane filament of the present invention is completely different from Schuhmacher et al. US '373. Also, Wilkinson US '137 fails to teach or suggest the claimed NCO/OH ratio. Thus, claims 8, 24 and 26 are also patentable over the combination of the cited references.

Further, none of the cited references discloses or suggests the claimed amount of isocyanate groups (i.e., "the prepolymers are reacted so that the amount of isocyanate groups

remaining in a just-spun filaments is 0.3 to 1 wt%") (see claims 8, 25 and 27). Thus, claims 8, 25 and 27 are also patentable over the combination of the cited references.

Based on the foregoing considerations, Applicants respectfully request that the Examiner withdraw the rejections.

CONCLUSION


Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance clearly indicating that each of the pending claims is allowed.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Toyohiko Konno, Reg. No. L0053 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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